BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(12) UK Patent Application (19) GB (11) 2 064 727 A

(21) Application No 8037330
(22) Date of filing
20 Nov 1980
(30) Priority data
(31) 5182/79
(32) 5 Dec 1979
(33) Denmark (DK)
(43) Application published
17 Jun 1981
(51) INT CL³ F16K 3/08
(52) Domestic classification
F2V E1H M1H M2H
(56) Documents cited
GB 438089
IL 57097 A =
GB 2022218 A
(58) Field of search
F2V
(71) Applicant
Broen Armatur A/S
Sdr Ringvej
5610 Assens
Denmark
(72) Inventors
Kunto Ilmari Katva
Johan Christian
Gregersen
(74) Agents
Mathisen Macara & Co
Lyon House
Lyon Road
Harrow
Middlesex
HA1 2ET

(54) Stop or mixing valves

(57) A stop or mixing valve consists of a housing (1) in which a stationary control body and a rotatable control body (15) are arranged. The control bodies contact each other along planar, wear-resistant surfaces wherein one or more control slots 25 and recesses 30 are respectively provided in order to control the flow rate and, in case a mixing valve is concerned, also the mixing ratio. In order to, in particular at the beginning of the opening and at the end of the closing of the valve, reduce the noise of the valve as much as possible each of the control slots and recesses (25 and 30 respectively) comprises a control edge (26 and 30a respectively) which extends along a spiral with respect to the central axis (27) of the control bodies. Geometrically the or each pair of control edges (26 and 30a) are shaped as spirals of Archimedes in such a way that the edges define a long slot having a width which is constant along the length of the slot.

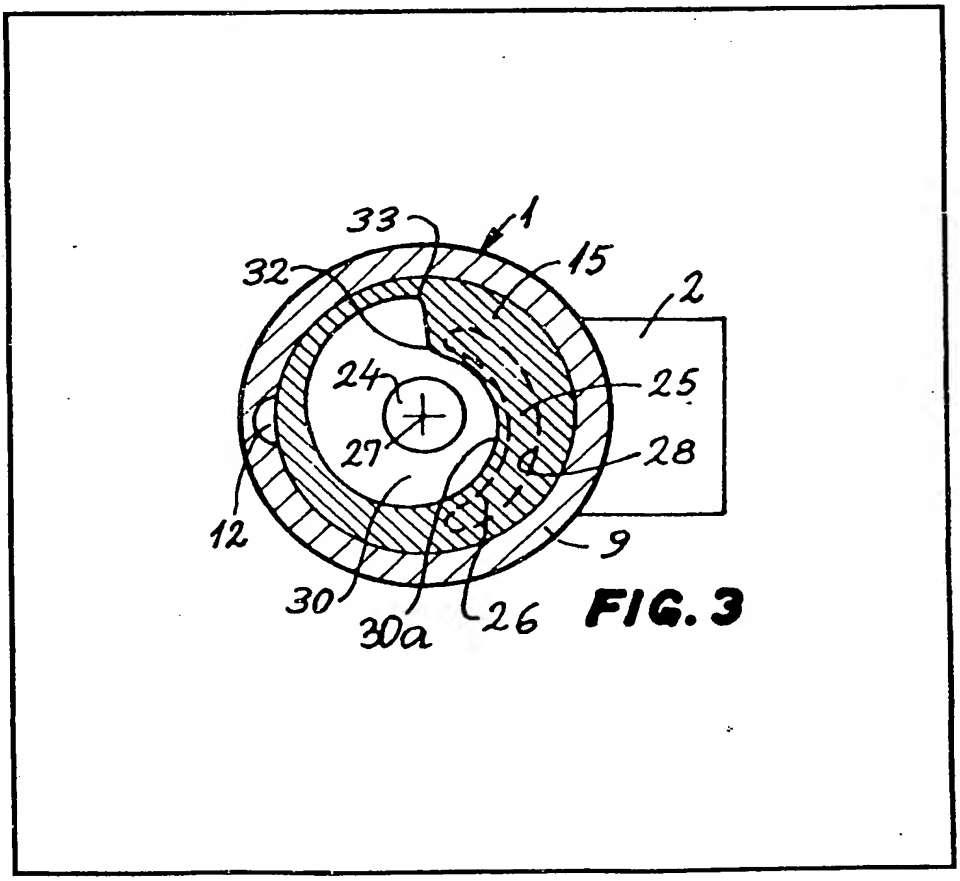

FIG. 3

2064727

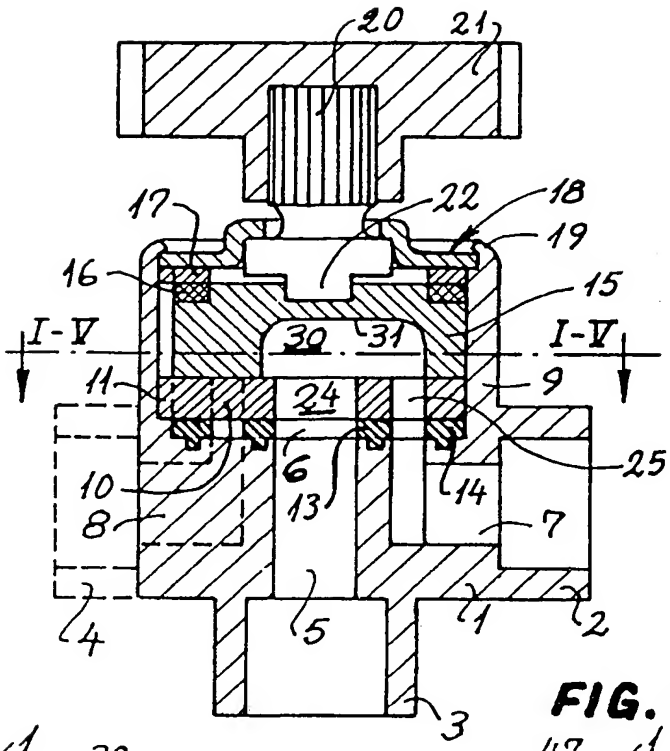

FIG. 1

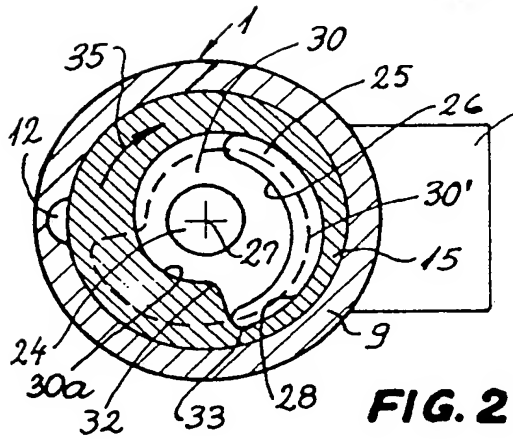

FIG. 2

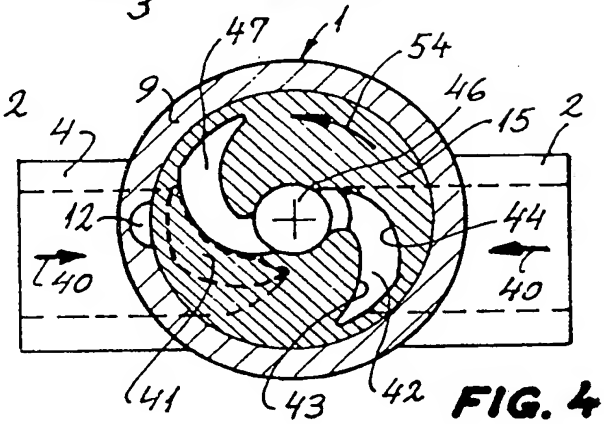

FIG. 4

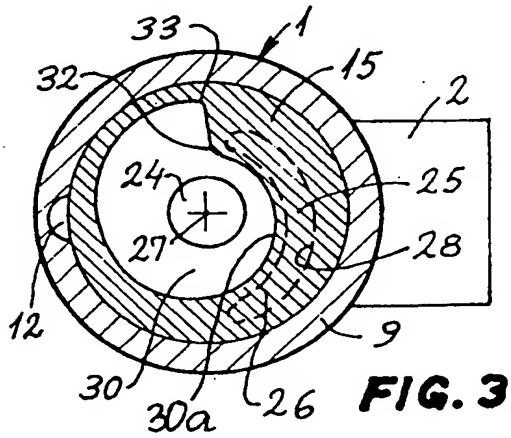

FIG. 3

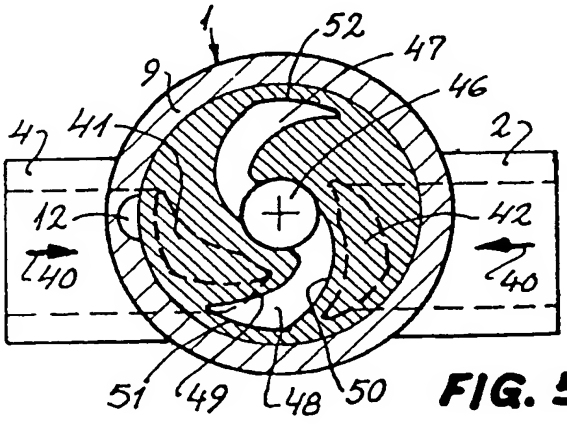

FIG. 5

SPECIFICATION

Stop or mixing valve

The present invention relates to a stop or mixing valve comprising a housing wherein a rotatable and a stationary control body are arranged, which are in contact with each other by means of planar, wear-resistant surfaces and wherein control recesses are provided.

A stop valve of the kind referred to is known from Swedish patent specification No. 82990. According to this prior art a plate of a material wherein a control opening shaped as a kidney is provided, is stationary arranged in the valve housing, and, moreover, a plate of another material wherein a circumferentially extending control opening is provided, the width of which decreases in the circumferential direction, is movably arranged in the valve housing. Moreover, this known valve comprises a handle with a spindle which extends through the centre of the stationary plate and is connected with the movable plate in such a way that closing and opening can be carried out by rotating the latter. Moreover, reference is made to the same applicant's prior Danish patent application No. 125/79, filed 11.1.1979, with the title "Control or Mixing Valve". According to last mentioned application the control recesses are defined by edges shaped as circle arches and extending coaxially with the corresponding control bodies and by control edges extending in the radial direction.

During further developments of valves according to the last mentioned application it has been proved that noise problems arise which are believed to be caused by the shape of the control recesses.

The stop or mixing valve according to the present invention is characterized by each control recess comprises at least one edge shaped as a spiral of Archimedes with respect to the central axis of the corresponding control body, and that said edges shaped as a spiral of Archimedes pairwise correspond geometrically to each other. By the term "a spiral of Archimedes" as used in the present specification a spiral shaped curve is to be understood, the distance of which from the corresponding centre by a constant rotation of angle increases by a constant increment. By using this particular shape it has been proved that the noise, in particular during opening and/or closing of the valve, is considerably reduced due to the fact that by the initial opening and/or at the end of the closing a long slot is formed between the edges shaped as a spiral of Archimedes, and the width of such slot immediately before closing and immediately after opening is constant along the full length of the slot, whereby the pressure loss energy of the valve will be distributed along the long slot shaped opening and thereby a considerable noise reduction is achieved.

In order to achieve this result both at the beginning of the opening of the valve and at the end of the closing movement an embodiment of the valve is according to the invention characterized by at least one of said control recesses being defined by a further edge shaped as a spiral of Archimedes with respect to the central axis of the corresponding control body and by the two edges shaped as a spiral of Archimedes of said control recess being geometrically similar.

A further embodiment of the stop valve according to the invention is characterized by each of the edges shaped as a spiral of Archimedes extends approximately from a position adjacent a central passage and to a position adjacent the periphery of the corresponding control body. By means of this embodiment a maximum length is achieved as regards the slot previously referred to.

In this connection and when a mixing valve is concerned, at least said one control edge shaped as a spiral of Archimedes of each control recess may extend along an angle of approximately 90° around the centre of the corresponding control body.

Further advantages and structural features according to the present invention will be explained more detailed in the following with respect to the drawings on which:

Figure 1 shows an axial section of an embodiment of the stop valve according to the present invention. However, in this figure the shape of the valve housing, in the case a mixing valve is concerned, is indicated by broken lines,

Figure 2 shows a section according to line IV–IV in Fig. 1, in the case where a stop valve is concerned, and illustrating the valve in the full open position,

Figure 3 shows a section corresponding to Fig. 2 wherein, however, the valve is completely closed,

Figure 4 shows a section according to line IV–IV in Fig. 1 in the case where a mixing valve is concerned, and wherein the valve is illustrated fully open as regards one inlet and immediately before opening of another inlet, and

Figure 5 shows a section corresponding to Fig. 4 in the closed position of the valve.

On the drawing 1 is a valve housing which according to the embodiment shown with full lines in Fig. 1 is provided with a laterally extending connection 2 and a downwardly directed connection 3. In case a valve housing for a mixing valve is concerned, the valve housing is supplemented by a further laterally directed connection 4 as indicated by broken lines in Fig. 1. In case where a stop valve is concerned, the direction of passage of the liquid through the valve is arbitrary, and both

the downwardly directed connection 3 and the laterally directed connection 2 may be used as inlet for the valve. In the case a mixing valve is concerned the two laterally directed connections 2 and 4 are used as inlets and the downwardly directed connection 3 is used as outlet.

The connection 3 communicates with a flow duct 5 which extends centrally through the housing 1 and which at the upper end opens into a flow passage 6. Each of the laterally directed connections 2 and 4 communicates with an angular duct 7 and 8 respectively, which open laterally with respect to the flow passage 6. At the top the valve housing is provided with a collar 9 wherein a disc shaped control body 10 is arranged. The control body 10 has a lateral projection 11 which engages a corresponding axially extending groove 12 (Fig. 2) in the collar 9 in such a way that the control body 10 is secured in the circumferential direction. By sealing means 13 and 14 the control body 10 is sealed with respect to the valve housing in such a way that liquid is prevented from flowing over from the flow passage 6 and to the ducts 7 and 8 and between the ducts 7 and 8 respectively and outwardly along the surface of the collar 9.

Above the control body 10 a further disc shaped control body 15 is arranged, at the top surface of which a sliding ring 16 is inserted for cooperation with a corresponding sliding ring 17 inserted at the top of the collar 9. The valve is provided with a closure 18 which by means of an inwardly bent part 19 of the collar 9 is maintained in contact with the ring 17 which contacts the ring 16 which finally presses the control body 15 against the control body 10 in such a way that the latter is pressed against the sealing means 13 and 14.

The closure 18 is provided with a central opening for a spindle 20, to which a handle 21 is secured. At the lower end the spindle 20 is provided with a ridge 22 which engages a corresponding notch extending diametrically in the upper surface of the control body 15 in such a way that the latter may be rotated by means of the handle 21.

In the case a stop valve (Figs. 2 and 3) is concerned the stationary control body 10 is, further to a centrally arranged flow passage 24, provided with a control recess 25 arranged laterally with respect to the flow passage 24 and communicating with the duct 7. The shape of the control recess 25 clearly appears from Fig. 2. Inwardly the recess 25 is defined by a control edge 26 which extends along a spiral with respect to the central axis 27 of the valve housing, and the geometrical shape of the spiral which the edge 26 follows, is a so called spiral of Archimedes, i.e. a curve, the radial distance of which from the central axis 27 by a constant rotation of angle is increased by a constant increment. Such curve may also be defined as being generated by a point having a uniform motion around a fixed point combined with a uniform motion away from the fixed point. According to the embodiment illustrated on the drawing also the outwardly directed edge 28 of the control recess 25 is shaped as a spiral of Archimedes, viz. the same spiral which forms the basis of the control edge 26.

In the surface of the control body 15 facing the control body 10 a control recess 30 is provided. The shape of the control recess 30 appears, in case a stop valve is concerned, clearly from Figs. 2 and 3. The recess 30 is generally shaped as a dome having a flat ceiling 31 as shown in Fig. 1 which smoothly curves into a side wall, the vertical projection of which appears from Figs. 2 and 3. The side wall extends along a spiral from a point 32 and to a point 33 in order to form a control edge 30a which also is shaped as a spiral of Archimedes having the same "pitch" as the curves along which the edges 26 and 28 extend. The step which, due to the shape of the edge 30a, results between the points 32 and 33, is wider than the maximum width of the control recess 25, and the maximum radial distance of the wall of the recess 30 from the central axis 27, corresponding to the point 33, corresponds to or is greater than the maximum distance between the control edge 28 and the axis 27. On the other hand the minimum distance between the wall of the recess 30 and the central axis 27 (at the point 32) is less than the minimum distance between the axis 27 and the control edge 26.

The valve illustrated in Figs. 2 and 3 operates in the following way:

As previously mentioned Fig. 2 shows the valve in fully open position wherein the control edge 28 according to the embodiment illustrated extends flush with the corresponding part of the wall of the recess 30. The valve is being closed by moving the control body 15 in direction of the arrow 35 in Fig. 2, whereby the control edge 30a constituted by the wall of the recess 30 will overlap the control recess 25 more and more as indicated by the broken line 30', and this overlap will, due to the spiral shape used, generally have the same width along the full length of the control recess 25. This condition will continue until the control body 15 covers the control recess 25 completely, and in this connection it should be noticed that the width of the slot defined by the control edges 26 and 30a will be generally constant along the full length of the slot immediately before the closing is completed. Accordingly, the pressure loss energy of the valve, in particular at the instance where said energy is at its maximum, viz. at the end of the closing movement, will be distributed along the full length of the slot, and, accordingly, also along the full length of

the control edge 26. It will be understood that the same phenomenon results by initial opening, viz. if the control body 15 in Fig. 3 is rotated anti-clockwise.

According to the embodiment illustrated in Figs. 2 and 3 the wall of the recess 30 is, as seen in the vertical projection, shaped as a spiral of Archimedes along the full length, however, with the exception of the part of the wall which forms the step between the points 32 and 33. However, due to the fact that the conditions at the beginning of the opening and the end of the closing in particular cause noise, it will be understood that it is only necessary to shape the inner control edge 26 and that part of the wall of the recess 30 which cooperates therewith during the beginning of the opening and at the termination of the closing as spirals of Archimedes.

As previously mentioned Figs. 4 and 5 illustrate an embodiment of the invention in the form of a mixing valve, and, accordingly, the valve housing is provided with two laterally directed connections 2 and 4. Moreover, the flow direction in this embodiment will be previously determined, viz. as indicated by means of arrows 40 in Figs. 4 and 5. In the embodiment illustrated in Fig. 4 and 5 the stationary control body 10 is provided with two control recesses 41 and 42, each of which communicates with one of the ducts 8 and 7 respectively. Each of the two recesses 41 and 42 is defined by two control edges 43 and 44 (Fig. 4) which are shaped as geometrically similar spirals of Archimedes. Due to the fact that two control recesses must be provided, the control edges 43 and 44 will be shorter than the control edges 26 and 28 in Figs. 2 and 3, which extend along approximately 180°, whereas the control edges 43 and 44 according to Figs. 4 and 5 extend along approximately 90°. The rotatable control body 15 in Figs. 4 and 5 is provided with a control recess, the vertical projection of which is shown in said figures. Also in this case the control recess in the control body 15 comprises a flat bottom, and, accordingly, does not continue to the upper surface of the control body 15. From a centrally arranged flow passage 46 the control recess in the control body 15 extends in a hook-like fashion outwardly in opposite directions in order to form two portions 47 and 48, each of which is defined by two control edges 49 and 50 (Fig. 5) which along the major part of their length are shaped as a spiral corresponding to the shape of the spiral of the edges 43 and 44. However, this does not apply as regards the inner ends of the portions 47 and 48, viz. at the positions where these portions open into the centrally arranged flow passage 46. Outwardly the portions 47 and 48 are defined by wall parts 51 and 52 extending along circular arches, and the wall parts 51 and 52 extend coaxially with the corresponding edges which define the control recesses 41 and 42 outwardly.

The portions 47 and 48 are spaced 180° in the circumferential direction from each other which, however, does not apply as regards the control recesses 41 and 42, seeing that the latter are spaced in the circumferential direction in such a way that when one of the portions, cf. 42 in Fig. 4, fully overlaps the control recess 42, the other portion 47 will be positioned a little offset with respect to the other control recess 41.

The operation of the mixing valve according to Figs. 4 and 5 will easily be understood with reference to the explanation of the operation of the valve according to Figs. 2 and 3. However, it should be mentioned that by rotating the upper control body 15 from the position shown in Fig. 4 and in the direction of the arrow 54 an initial opening of the control recess 41 will result along the full length of one of the control edges thereof and with a slot width which is constant along the full length of the slot, and simultaneously closing of the other control recess 42 will be initiated in such a way that the inlet through the connection 2 will be throttled. Accordingly, a gradual mixing of e.g. water which arrives via the connection 2 with e.g. water which arrives via the connection 4 will result, and the mixed water will leave the valve via the downwardly directed connection 3 of the valve, cf. Fig. 1. When the control recess 41 has been fully opened, the control recess 42 will be closed, and during this closing a slot narrowing as previously explained will result. The valve is illustrated in the closed position in Fig. 5 from which it will be seen that the portion 48 can be positioned between the control recesses 41 and 42.

Accordingly, due to the two-sided spiral form of both the portions 47 and 48 and of the control recesses 41 and 42 of Figs. 4 and 5 a noise reduction is achieved both by the opening and the closing of both of the control recesses 41 and 42.

It will be understood that according to both the embodiments illustrated the sides of the control bodies 10 and 15 which faces each other are completely planar in such a way that the cooperating surfaces form seals along the sides of the control recesses. The control bodies may e.g. consist of sintered cheramic material or a corresponding wear resistent material which may be given the plane form necessary in order to achieve the sealing effect requested.

CLAIMS

1. Stop- or mixing valve comprising a housing (1) wherein a rotatable and a stationary control body (10 and 15 respectively) are arranged, which are in contact with each other by means of planar, wear resistant surfaces, and wherein control recesses (25; 41,

42 and 30; 47, 48 respectively) are provided, characterized by each control recess (25; 41, 42 and 30; 47, 48) comprising at least one edge (26, 28, 30a, 43, 44, 49, 50) shaped as a spiral of Archimedes with respect to the central axis (27) of the corresponding control body (10 and 15 respectively), and that said edges shaped as a spiral of Archimedes pairwise correspond geometrically to each other.

2. Control- or mixing valve according to claim 1, characterized by at least one of said control recesses (25, 41, 42) being defined by a further edge shaped as a spiral of Archimedes with respect to the central axis (27) of the corresponding control body and by the two edges (26, 28; 43, 44; 49, 50) shaped as a spiral of Archimedes of said control recesses (25, 41, 42) being geometrically similar.

3. Stop- or mixing valve according to claim 2, characterized by each of the edges (26, 28, 43, 44, 49, 50) shaped as a spiral of Archimedes extending approximately from a position adjacent a central passage (24) and to a position adjacent the periphery of the corresponding control body (10 and 15) respectively.

4. Stop valve according to claim 1, characterized by at least one of the control edges (26 or 28) shaped as a spiral of Archimedes extends along an angle of approximately 180° around the centre (27) of the corresponding control body (10).

5. Mixing valve according to claim 1, characterized by the control edge shaped as a spiral of Archimedes of each control recess (41, 42) extends along an angle of approximately 90° around the centre (27) of the corresponding control body (10).

6. A mixing valve substantially as hereinbefore described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.